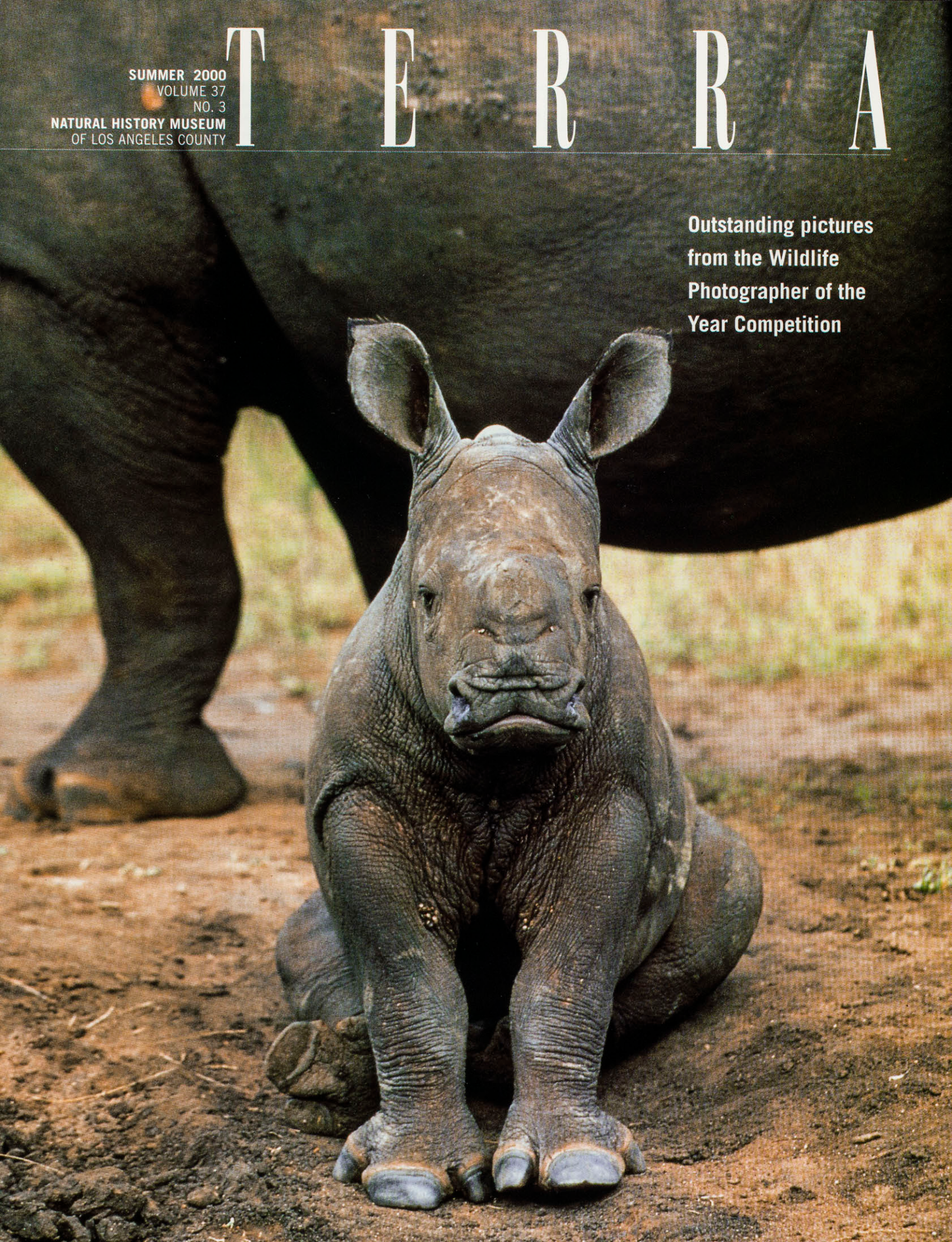


SUMMER 2000
VOLUME 37
NO. 3
NATURAL HISTORY MUSEUM
OF LOS ANGELES COUNTY

T E R R A

Outstanding pictures
from the Wildlife
Photographer of the
Year Competition



Wildlife Portfolio

The Best Photographs of 1999

EIGHTY OF THE BEST NEW WILDLIFE PHOTOGRAPHS IN THE WORLD—and transparencies of another sixty highly commended works—are on exhibition from August 5 through November 5 at the Natural History Museum, Exposition Park. The images are winners in the annual BG (British Gas) Wildlife Photographer of the Year competition, which is organized by *BBC Wildlife* magazine and the Natural History Museum in London.

In 1999, its sixteenth year, the contest attracted 21,000 entries from photographers in sixty-six countries. Technical excellence in the photographs was assumed by the panel of judges, and the awards were made instead on the basis of aesthetic appeal and originality of approach. The result is a collection that not only shows the creativity and perseverance of individual photographers but also gives indication of new directions in documentary still photography as a whole.

For the scientific expert's perspective on the exhibition photographs, *TERRA* asked members of the curatorial staff of our museum to select and comment on winning and highly commended photographs related to their fields of study.

WEAVER BIRD BUILDING NEST, by Manoj Shah, United Kingdom. Highly commended, Animal Behavior, Birds.

Few birds combine the art of nest-building and a zeal for attracting a mate as intricately as the weavers of the genus *Ploceus*. Primarily from sub-Saharan Africa, these master avian architects employ a variety of loops, knots, and hitches in the construction of their nests. The pictured male, a Village (or Black-headed) Weaver, *Ploceus cucullatus*, builds his nest in a series of stereotyped stages—first a woven ring, then successively the roof, egg chamber, antechamber, and entrance tube. He then vigorously displays, hanging from the bottom of the completed nest shell while flapping his wings and singing. If a visiting unmated female accepts the nest, and thus the male, she will complete the structure by lining the inside with softer materials.

Not only has this male's weaving captured the attention of passing nature photographer Manoj Shah, but its behavior and that of other nest-weaving bird species has been the foundation for decades of research by now-retired UCLA biology professor Nicholas Collias and his wife Elsie, both research associates in ornithology at our museum. The Colliases' comprehensive book, *Nest building and bird behavior* (Princeton University Press, 1984), remains a standard reference for ornithologists.—Kimball L. Garrett, Ornithology Collections Manager



COVER: WHITE RHINO CALF, by Martin Harvey, South Africa. Highly commended, Gerald Durrell Award for Endangered Wildlife.

Photographs from among the winning and highly commended images in the BG Wildlife Photographer of the Year Competition organized by *BBC Wildlife* magazine and the Natural History Museum, London, and sponsored by British Gas International



DUGONG FEEDING ON SEA GRASS, by Pete Atkinson, United Kingdom. Runner-up for the Gerald Durrell Award for Endangered Wildlife.

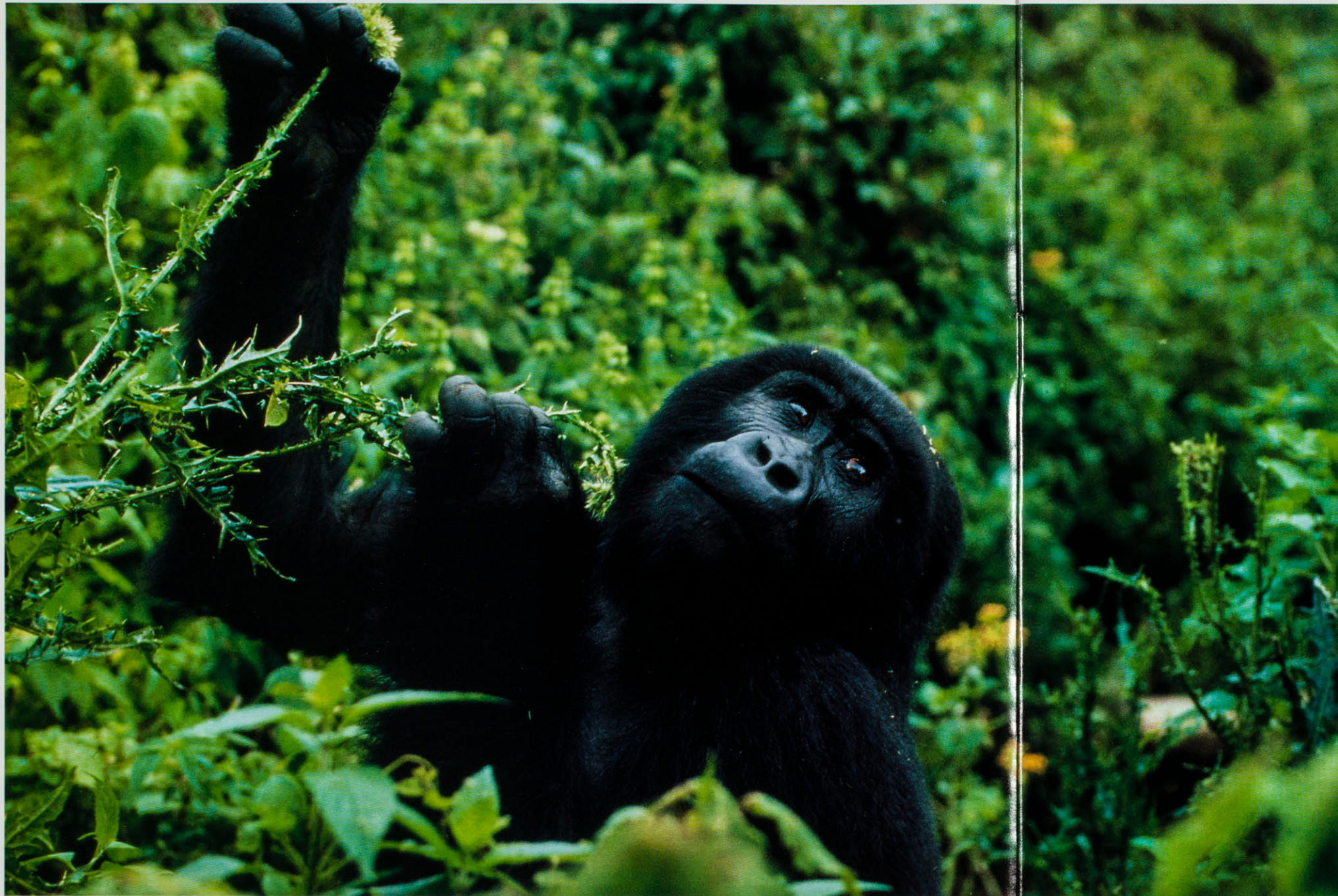
This male dugong is feeding on sea grasses off Epi, one of the islands that make up the country of Vanuatu, near New Caledonia in the South Pacific. Every one or two minutes, the dugong must travel to the surface for air; meanwhile, its valve-like nostrils prevent water from entering as it moves along, grazing underwater.

The dugong, which can reach almost 13 feet in length and weigh as much as 2,000 pounds, is one of the last members of the Sirenia, a group of

aquatic mammals that includes the manatees and was formerly very widespread. Dugongids evolved in the Mediterranean region more than 45 million years ago and then dispersed westward across the Atlantic Ocean, which was then rather narrow, to the Caribbean. From there, they diversified and spread along the Atlantic coast of North America and through the open Panamanian Seaway to the Pacific coast of South America and virtually the entire margin of the North Pacific.

In historic times, the dugong had a close relative in Steller's Sea Cow, a 26-foot-long dugongid that, when first identified in the 1740s, was re-

stricted to shallow waters off the Aleutian Island chain; within 27 years of its discovery, this cold-water species had been virtually exterminated by visiting hunters and traders. Our museum has several important fossil sea cow specimens from the west coast of North America, and these help tell the story of how tooth-bearing sirenians that fed on bottom plants like sea grasses evolved into toothless species, such as the extinct Steller's Sea Cow, that specialized in browsing on the fronds of surface-living kelp.—Lawrence G. Barnes, Curator of Vertebrate Paleontology



MOUNTAIN GORILLA INVESTIGATING THISTLE, by Konrad Wothe, Germany. Highly commended, Gerald Durrell Award for Endangered Wildlife.

As this male mountain gorilla (*Gorilla gorilla beringei*) delicately plucks at a spiny thistle, its forehands with their heavily padded knuckles are on view. Although gorillas can stand and move about upright, they are mainly quadrupedal. They walk on the soles of their hind feet; but rather than supporting themselves on the palms of their hands like most other primates, they balance on the knuckles of their forelimbs, as chimpanzees do.

Both gorillas and chimpanzees display a suite

of characteristics in their hands and wrists that suit them for knuckle-walking, and these traits used to be considered evidence that the two kinds of apes were each other's closest evolutionary relatives. However, comparisons of their molecular traits went against this hypothesis, instead linking chimpanzees with humans and showing gorillas as the closest living relatives of this pair. Recent research has made the knuckle-walking features less important in sorting out the closeness of the relationships among these primates: it seems that some early hominids also had these same hand and wrist characters (although the

knuckle-walking traits disappeared in the hominid line as it gave rise to *Homo sapiens*). With no distinctive bodily features remaining to link gorillas and chimpanzees directly, the molecular idea about the closeness of their relationship to each other—and to hominids—is gaining support.

Mountain gorillas are the most folivorous of the apes, feeding mainly on the leaves and stems of plants rather than on the fruits. As more of their open-canopy ranges are converted to agricultural land, they have also become the most endangered of the gorilla subspecies.—*Inés Horovitz, Assistant Curator of Mammals*

YELLOW SEA HORSE IN KELP FOREST, by Darryl Torckler, New Zealand. Highly commended, *The Underwater World*.

Sea horses are most often seen at rest, hanging gently in the water with their prehensile tails wrapped around the stems of sargassum, sea grasses, or some other underwater vegetation. But this tiny individual has straightened its tail and is underway, maneuvering at an unhurried pace through a kelp forest. Although sea horses are slow-moving fish, their dorsal fins move very quickly, fluttering nearly as fast as a hummingbird's wing. Some species have fleshy

projections, which may be long and intricate, all over their bodies; these serve to camouflage them among the seaweeds where they live.

Most species of sea horse are tropical, but temperate species are found as far north as the southern United States and as far south as New Zealand, where this photo was taken. One species has even been recorded in the Thames River in London. There is also a species found off the southern California coast, but it prefers to live among sea grasses rather than in our lush kelp beds.

The beautiful, bizarre appearance of the sea horse has a major drawback: humans prey on

them, collecting them for display or for folk medicine. In some places, most notably the Philippines, sea horses have nearly been driven extinct by uncontrolled fishing.—*Christine Thacker, Assistant Curator of Ichthyology*





ANACONDA MATING BALL, by François Savigny, France. Highly commended, Animal Behavior, All Other Animals.

Anaconda orgies like this one in a swamp in Venezuela consist of two to twelve males coiled around one female and may last for as long as two to four weeks. In these slow-motion wrestling matches, each male tries to maneuver into a mating position with the female and at the same time keep other males from doing so, with victory going to the strongest. Because the female is three to five times larger than the males, she may use her superior strength to select some suitors over others. The breeding balls also provide researchers with the opportunity to capture the males and remove them to the laboratory for further study while allowing the female to go free to attract other suitors.

The anaconda (*Eunectes murinus*) lives in Amazonia and adjacent regions of South America and is one of the largest living snake species; individuals have been reported to attain lengths of approximately 30 feet and to weigh more than 200 pounds. These giant carnivores prey on a wide variety of animals, including caiman, deer, and—very rarely—humans.—David Kizirian, Assistant Curator of Herpetology

KILLER WHALE CHASING SEAL, by Winfried Wisniewski, Germany. Highly commended, Animal Behavior, Mammals.

Populations of killer whales (*Orcinus orca*) often specialize in capturing certain types of prey. Scientists working out of Puget Sound report that one group living off the coast of the Pacific Northwest has perfected a strategy of working cooperatively to herd along huge schools of salmon, concentrating them so that the fish at the periphery can easily be picked off by members of the pod. Other killer whale groups in the same area focus instead on hunting seals and sea lions.

Along the coast of Patagonia, several groups of killer whales employ a practice of rushing at the beach and partially stranding themselves on the steep berm; the goal of this activity is to capture a favorite prey, South American sea lions (*Otaria flavescens*), while they enter or leave the water. Adult male orcas may catch a sea lion in this way and then release it just offshore in the presence of younger whales, to train them in the unusual mode of hunting.

Photographer Winfried Wisniewski reports that the onshore surge of the killer whale shown here—one of a pod of seven young females hunting off Peninsula Valdés in Argentina—was a little off the mark: the sea lion pup that was the whale's intended meal escaped unharmed.—John E. Heyning, Deputy Director for Research and Collections



Babysitting Brittle Stars, Kidnapping Cuckoos, and Other Deceptions in the Nursery

GORDON HENDLER

Once upon a time, something mysterious began to happen in a village concealed in deep oak woods. In the evenings, when lights in the village winked out, mother squirrels clambered from the oaks carrying their wriggling babies. Stealthily, they hauled their broods to nearby houses and scrambled into bedrooms where village babies lay in cribs. Ever so carefully, each mother squirrel slipped her pups beneath the coverlets beside a plump human infant. While the stars still twinkled, the squirrel mothers then ran back to their own tree nests.

Imagine the shock of visitors to that hidden hamlet who arrived one summer when a scorching drought exposed fords bridging treacherous rivers. The newcomers found the villagers straining behind perambulators overflowing with fat, squirming squirrel pups. And they were aghast to see haggard village matrons nursing chirping squirrel tots while ignoring their own sickly, screaming young. "How can it be?" the travelers wondered.

I ASKED MYSELF THAT QUESTION SEVERAL YEARS AGO, WHEN I FINALLY REALIZED THAT I had discovered nearly the same phenomenon—but one involving real brittle stars instead of furry-tailed fairy tale squirrels. This article is my account of those brittle stars and of Charles Darwin, some birds, fish, and ants, and a devious behavior known as brood parasitism, in which the young of one species receive free parental care from adults of another.

The story began with some parcels sent to me by Mark Grygier, a colleague studying parasitic crustaceans at Okinawa, Japan. Every package enclosed a small vial of alcohol containing a pale



PHOTOGRAPHS BY WILLIAM OMIKOTO

reddish brittle star. Each one, no bigger than this letter "O," had been salvaged from the dissection of a specimen of a large black brittle star species. Mark wondered if the lilliputian stars could be the young of the black brittle stars. That was a very hard question to answer. Baby brittle stars are notoriously difficult to identify: they bear so little resemblance to the adults they will become that some have mistakenly been described as new species, and even new genera. The reddish stars, so unlike any familiar adult brittle star, had me stumped, but I hoped that I could place them if I could see some bigger babies that looked more like their parents.

Luckily, my wish came true. In due course, Mark found larger individuals, which turned out to have distinct red spots. They were vaguely reminiscent of the only reddish species on the Okinawan reef, *Ophiomastix annulosa*, which is dappled and banded with complex geometric patterns of red, brown, black, and cream. But it still seemed very doubtful that the babies, with their remarkably thick skin, smooth central disks, and short-spined arms, could grow into *Ophiomastix* adults, which have disks that look like pincushions and exceedingly long, club-tipped arm spines.

Once a growth series of increasingly bigger babies had been assembled, it was clear that my hunch had been correct. The largest babies grew granules on the disk that then transformed into spines, and their overall coloration evoked the polychromatic tapestry of adult *Ophiomastix annulosa*. After being confused by these little animals for a couple of years, finally having a name for them provided relief—

but not great enlightenment. For there was virtually nothing known about the species, save that the adults live on coral reefs from the Maldives in the Indian Ocean to the South Pacific.

In contrast, the big black brittle star on which the *Ophiomastix annulosa* had been found has more celebrity status. It was easily identified as *Ophiocoma scolopendrina*, one of the most wide-ranging of Indo-Pacific brittle stars and exceptional for congregating in huge assemblages in the intertidal zone. On the daily incursion of the tide, as seawater creeps landward, *Ophiocoma scolopendrina* by the thousands extend their long black arms from crevices in the pitted and cracked reef pavement. The arms sweep back and forth, stroking the surface of the water, gathering particles of food, and lending reef rocks the appearance of animated toupees.

Some brittle stars are viviparous, rearing their young internally in pockets called bursae, which double as gills and brood pouches. But although *Ophiocoma scolopendrina* has bursae, it does not brood. Instead it spawns eggs that scatter and grow into microscopic, free-floating larvae, each with a transparent body and an exquisite glassy skeleton. The larva is essentially the brittle star's "caterpillar" stage. After eating phytoplankton salad for roughly a month, the fortunate larval survivors metamorphose into baby brittle stars and settle toward the reef, sometimes landing in the vicinity of adult *Ophiocoma scolopendrina*. Thereafter, the relationship between juveniles and adults seems to be one of casual indifference.

Thus it seemed quite curious to find baby *Ophiomastix annulosa* associated so intimately with adult *Ophiocoma scolopendrina*, a species that does not care for its own young. Stranger still,



An *Ophiomastix annulosa* family album, showing progressive changes in appearance as an individual grows, from the smallest parasite (far left) associated with babysitting *Ophiocoma scolopendrina* to a free-living adult. The photographs are not all at the same magnification: the central disk of the spineless, nearly colorless juvenile at far left is only about four hundredths of an inch in diameter, while that of the spiny, polychromatic adult at far right is one inch across. The intervening images represent transitional stages with disk spines and color patterns of increasing size and complexity.

Juvenile *Ophiomastix annulosa* part company with their hosts after their disk spines become slender and sharp, as in the second individual from the right, which has a disk diameter of four tenths of an inch.

Ophiomastix arms could be seen jutting from the bursae in the bodies of adult *Ophiocoma*, looking every bit like the arms of viviparous embryos. It appeared that *Ophiocoma scolopendrina* was acting as a nursemaid.

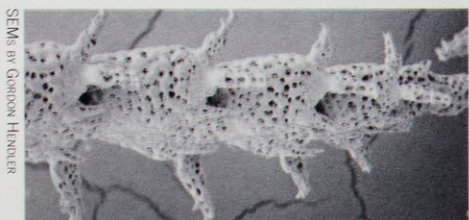
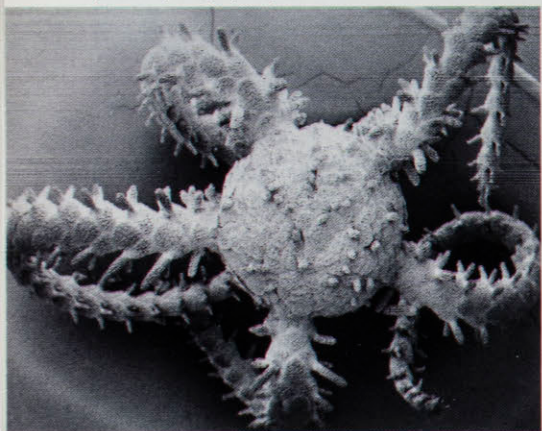
I FELT LIKE MAGELLAN, just for an instant, when I realized that such a close association between two brittle star species had never before been reported. But I was baffled as to why and how the babies of an offshore coral reef brittle star came to dwell within the bodies of the adults of another species living in the harsh intertidal habitat. Although an authoritative reference has claimed that brittle stars in general are never parasitic, parasitism or a mutually satisfactory commensal relationship seemed to be possibilities in this case. I needed to take a closer look at the Okinawan brittle stars, but I didn't have a ticket to Japan.

Fortunately, at that point I was able to enlist the help of two highly enthusiastic students enrolled in the museum's Research Apprenticeship Program. In summer 1997 Elisa Maldonado, Jessica Denton, and I spent several days a week measuring preserved *Ophiocoma scolopendrina*, dissecting open their bursae, and removing and measuring baby *Ophiomastix annulosa*; with Elisa's assistance, the project continued through the rest of the year. By meticulously examining more

Right: The star-shaped mouth of *Ophiocoma scolopendrina* is on its disk near the center of this photograph, and the pale undersides of its five arms radiate out toward the edge of the picture. Just above the mouth, two small reddish arms of a baby *Ophiomastix annulosa* snake across the disk. The central body of the little parasite and its other three arms are concealed within one of the host's ten bursae, its sac-like respiratory structures. The parasite's free arms extend from the entrance of the bursa, where they are clearly within reach of food entering the host's mouth. To understand the peculiar relationship of these two animals, imagine having a personal parasite occupying one of your lungs, with its arms extending from your nostrils to scrounge bits of food from your lips!

Below: Two low-power scanning electron micrographs of a juvenile *Ophiomastix annulosa* that was removed from a specimen of *Ophiocoma scolopendrina*. The central, scale-covered portion of the body (top) is 8 hundredths of an inch in diameter; each hook-shaped spine shown in the close-up of the tip of its arm is roughly only 4 thousandths of an inch long. The combined effect of hundreds of the diminutive toothed spines projecting from each baby brittle star's five tiny clasp arms may prevent the host from dislodging the parasite.

The multitude of minutely perforated "bones" that make up the juvenile brittle star's skeleton can be clearly distinguished in these photographs because a superficial layer of protective skin was dissolved by applying dilute household bleach to the specimen prior to photographing it.



SEMs by Gordon Huxford

than 2,000 specimens of *Ophiocoma*, we found 40 specimens of *Ophiomastix*. On that basis, we estimated that, throughout the year, around 4 percent of the *Ophiocoma* population housed little *Ophiomastix*.

Meanwhile, Mark Grygier was observing the brittle stars in the field. In most cases, the baby *Ophiomastix* were found with their disk-shaped bodies inside the bursae of their hosts and one or two arms extended from the bursal opening. Even though the babies moved rather sluggishly, when separated from an *Ophiocoma* they attempted to remount their former nursemaid. And despite the considerable size that some of the babies attained while living inside bursae, they appeared to cause their hosts no harm: even though the tissue of the bursa is diaphanous and just a few cells thick, it was never ruptured by the activities of the spiny little babies within.

With a treasure trove of little *Ophiomastix* to examine, we were able to appreciate the drastic transformation in appearance the babies undergo as they grow. One noticeable change is the disappearance of the thick skin that may serve to protect the tiniest, most vulnerable juveniles. As the "baby fat" disappears, skeletal structures become apparent. Granules on the central disk turn to spines that might help defend the free-living young. Small hooked arm spines, which may enable the babies to better clasp their host and avoid being dislodged, eventually change into big blunt-tipped spines.

The largest of the *Ophiomastix annulosa* babies, with their five prehensile arms outstretched, could fit comfortably on a dime; all the little stars associated with *Ophiocoma scolopendrina* were the smallest ever found on coral reefs. Their hosts, whose arms could easily span an outstretched hand, were among the larger members of the *Ophiocoma* population. They were all adults of reproductive size and, perhaps unexpectedly, more often male than female. The smaller host individuals harbored the smallest *Ophiomastix annulosa*, but babies in a range of sizes occupied the largest *Ophiocoma* adults.

Juvenile *Ophiocoma scolopendrina* of about the same size as *Ophiomastix annulosa* babies sometimes mingled with adults of their own species but never lodged in the adults' bursae. They occurred in about the same relatively low numbers as the *Ophiomastix* babies and were often found under the adults; when disturbed, they did not cling to the adults like baby *Ophiomastix* but instead crawled or fell off.

Puzzling over the clues we had collected, we asked how the affiliation with *Ophiocoma* could benefit *Ophiomastix annulosa* juveniles and how it was maintained. The death rate of juvenile marine invertebrates is phenomenally high, particularly in the intertidal zone where small organisms must cope with drying, heating, exposure to solar radiation, and predators. Thus it makes



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Left: *Ophiomastix annulosa*, if it had a common name, might be referred to as the “cuckoo brittle star,” since its young are cared for by *Ophiocoma scolopendrina* rather than by close relatives or even other members of its own species. Its somewhat fanciful scientific name, however, means “ringed serpent-whip” and is based on its flexible, highly tapered and richly banded arms. Juveniles of *Ophiomastix annulosa*, like a number of other brood parasites, depend on the services of a somewhat related species: in this case, the brittle star parasites and their hosts are both members of the circumtropical family Ophiocomidae.

Right: Individuals of *Ophiocoma scolopendrina*, which babysit the offspring of *Ophiomastix annulosa*, can reach nearly 20 inches from armtip to armtip. The second word in the scientific name is derived from the Greek for “centipede,” alluding to the arthropod-like appearance of its long, spiny arms.

sense for the delicate, slow-moving baby *Ophiomastix* to seek shelter in a widespread, abundant, large, mobile, well-armored animal that occupies moist, protective crevices.

The minuscule size and extremely limited mobility of the smallest babies, which are practically helpless, suggests that they recruit to *Ophiocoma scolopendrina* immediately after they metamorphose from gossamer, floating larvae and settle on the reef. Although the swimming and navigational ability of brittle star larvae in general is slight, *Ophiomastix annulosa* larvae might be attracted to *Ophiocoma scolopendrina* and home in on a host. *Ophiomastix* larvae might even be gathered from the water by the outspread arms of feeding *Ophiocoma*.

The proportional relationship between the size of the babies and their hosts indicates that they probably move from small to bigger nursemaids as they grow. The migration would be fraught with danger for such delicate creatures, but the transfer could be facilitated by *Ophiocoma scolopendrina*'s habit of gathering in dense congregations.

Evidently by the time they grow to about one fifth of an inch across the central disk (and about thumbnail size overall), *Ophiomastix annulosa* babies are able to live independently. Their emergence from a host might be triggered by instinct, or at that size they may just be too large to fit comfortably inside an *Ophiocoma* bursa. Whatever the immediate cause, the juvenile *Ophiomastix* abandon their hosts and depart for deeper water, where desiccation, heat, and solar radiation are not hazards to their health. Perhaps, along the way, they even associate with adults of their own species.

While they live on and in *Ophiocoma scolopendrina*, are the *Ophiomastix annulosa* babies parasitic? It is likely that they can intercept particles of food that are conducted, like trains on a track, down the arms of the host toward its mouth: even the smallest babies have a mouth and gut and would be capable of gobbling nutritious morsels—in the same manner as the older embryos of any brooding brittle star species. When we reported our findings on *Ophiomastix annulosa* and *Ophiocoma scolopendrina* in the journal *Invertebrate Zoology*, we concluded that the relationship between the two species is probably brood parasitism, roughly comparable to that in birds and insects that leave their young in the care of another species. However, juvenile *Ophiomastix* are not placed on hosts by their mothers, and—because baby *Ophiocoma* do not frequently associate with adults of the species—there is little chance of competition between the juveniles of host and parasite.

Nevertheless, *Ophiomastix* young end up in the care of a surrogate parent. The parasitic juveniles may exploit the normal behavior pattern of indiscriminate adult *Ophiocoma*, which do not repulse the juveniles of their own species. In addition, the foster babies have adaptations, such as the hook-shaped arm spines, that may counteract defensive measures of their hosts.

*"Accounts of brood parasitism
make one wonder how and why
otherwise reasonable animals
would make a serious
investment in rearing
exceedingly unrelated broods
of young, often at the
expense of their own offspring."*

THE REFERENCE TO BIRDS AS BROOD PARASITES will be familiar to readers aware of the nefarious behavior of cuckoos. An interest in that topic was registered by Aristotle and renewed in 1788 by Edward Jenner. His careful account of cuckoo chicks heaving the eggs and fledglings of their hosts from the nest earned him a fellowship in the Royal Society of London years before his invention of small pox vaccination. In those days, some British naturalists were greatly relieved to learn that the mothers of the chicks were not responsible for their premature demise. Others of Jenner's contemporaries, imbued with the prevailing notions of moral theology, denied the truth of his observations.

In reaction to that controversy, Charles Darwin summed up what he called a "strange and odious instinct" as follows:

The young cuckoo, soon after birth, has the instinct, the strength, and a properly shaped back for ejecting its foster-brothers, which then perish from cold and hunger. This has been boldly called a beneficent arrangement, in order that the young cuckoo may get sufficient food, and that its foster-brothers may perish before they had acquired much feeling!

But wouldn't a truly "beneficent" cuckoo build its own nest and rear its own young? Darwin offered the cuckoo's behavior as evidence for natural selection, not of a divine natural order. However, not until the following century was natural selection generally accepted as an explanation for brood parasitism and the many astounding ramifications of the behavior well documented. Darwin would no doubt have been fascinated to learn how the Common Cuckoo, a species with which he was familiar, takes advantage of the little Reed Warbler by vocal trickery: recent studies show that the single, huge, and very hungry cuckoo chick, which all but overflows the warbler's tiny nest, induces the foster parent to bring prodigious rations by ratcheting up its cry until its rate of squawking matches that of an entire brood of warbler chicks.

As you can see, living up to the appellation "cuckoo" is no mean feat! Yet it is for good reason that other equally deceptive organisms are referred to as "cuckoos." The tiny cuckoo wasps, for example, are outstanding for their chitinous armor resembling repoussé metal enameled in brilliant, iridescent colors; some have even been likened to darting drops of molten gold. The most remarkable cuckoo wasp species forgo the drudgery of nest building, hunting, and child care by smuggling their eggs into the nest chambers of stinging wasps. Once hatched, the cuckoo larva first feasts on the young of the host wasp and then dines on the stash of spiders and insects that would have served as its victim's first meal.

If detected while surreptitiously laying eggs, mother cuckoo wasps deflect the jaws and stings of their irritated and pugnacious host by curling into an impervious ball, using their armored abdomen as a shield. Their disreputable mode of subterfuge is termed *kleptoparasitism*, since the stores of one species are, in Darwin's words, "feloniously appropriated" by another.

Perhaps the most devious cuckoo wasp is a little California species, *Pseudolopyga carilloi*. It avoids inopportune conflicts with its wasp host by injecting its tiny eggs into the guts of certain true bug species. The cuckoo babies survive only if the booby-trapped bug is later caught, stung, and paralyzed by one or another small black sphecoid wasps of the genus *Solierella*. The industrious sphecoid installs one of its eggs and several bugs in each cell of its nest. Once a cuckoo wasp's larva emerges from its Trojan bug, it eats the rival *Solierella* egg or larva, then feasts on the larder of paralyzed bugs that were generously provided by its host. It has a potential competitor in the larva of yet another species of cuckoo wasp, *Hedychridium solierella*, which deposits its eggs directly in the *Solierella* nest. Such are the complications of life on a planet dominated by invertebrates.

The machinations of cuckoo wasps are simple in comparison with the baroque transactions of certain ants that enslave other ant species as servants for themselves and their young. Although an ardent critic of human slavery, Darwin referred to the ant adaptation as one of "the most wonderful of all known instincts." Its most bizarre manifestation occurs in ants that not only dispense with foraging and child-rearing but also lack a worker caste and a private domicile. Perhaps the best example of a slave-making ant is *Teleutomyrmex schneideri*, a species that E.O. Wilson referred to as "the 'ultimate' social parasite."



Young Common Cuckoos (*Cuculus canorus*) in the care of adopted parents, the tiny Reed Warbler (*Acrocephalus scirpaceus*, right) and the Meadow Pipit (*Anthus pratensis*).

About 40 percent of the approximately 140 species of cuckoos are brood parasites that lay their eggs in the nests of other species and depend entirely on foster parents to incubate them and rear the young. Although the situation in these photographs may seem grotesque, it is not unusual for the young cuckoos to outgrow their hosts, which continue to feed and care for the oversized surrogate nestlings. Other avian brood parasites include the honeyguides and certain cowbirds and indigobirds.



In their native Swiss Alps, the *Teleutomyrmex* queens and males live as permanent guests inside colonies of a host ant species, *Tetramorium caespitum*. The parasites are small: several individuals can comfortably ride together on the back of one *Tetramorium*, and that is how they spend their time. They are so physically simplified, delicate, and helpless that they depend entirely on *Tetramorium* for their survival. The rent-free arrangement works because *Teleutomyrmex* exudes a substance that attracts the host workers that will provide them with sustenance, sanitation, and defense.

Although degenerate in some respects, *Teleutomyrmex* retains a remarkable talent for reproduction. The queens lay an average of one egg every 30 seconds; the resulting larvae and pupae are reared by host workers and develop into new queens and males. Thus, the *Teleutomyrmex schneideri* ants are impressively promiscuous and prolific but not to the extent that they outpace the housekeeping abilities of their duped *Tetramorium* servants.

The last cuckoo copycat in this story, the cuckoo catfish, is a resident of Lake Tanganyika in Africa. Mating pairs of the catfish take advantage of maternal mouth-breeding cichlids as foster parents for their offspring. The bewhiskered beige- and black-spotted catfish harass the spawning cichlids: almost as fast as the mouth breeders lay down and attempt to fertilize eggs the catfish gobble them up and scatter their own eggs in the cichlid's breeding pit. As the besieged mother cichlid, driven to frenzy, takes up her eggs, she accidentally gulps those of the marauding catfish as well. In the end, she unwittingly incubates a mouthful of catfish eggs mixed with her own.

Under ordinary circumstances the cichlid fry would be as safe in their mother's mouth as a joey in a kangaroo's pouch. However, the catfish eggs develop a tad quicker than the cichlid's, and the newly minted, exceedingly hungry catfish hatchlings dine on cichlid eggs. As they grow bigger and more ravenous, they suck dry the yolk sacs of their unfortunate mouth-mates and eventually swallow baby cichlids whole. Ultimately, one or more corpulent, contented catfish depart their cichlid stepmother, having done everything but bite the mouth that fed them.

IF WE ARE INTRIGUED by all these instances of brood parasitism—whether among birds, wasps, ants, fishes, or brittle stars—it may be because they say something about altruistic behavior, or because the contemplation of exotic alternative lifestyles has an irresistible appeal. Accounts of brood parasitism are definitely more down-to-earth than tales of extraterrestrial

PIGGYBACK PARASITE

THE DISCOVERY of brood parasitism in *Ophiomastix* sheds light on a baffling observation that I made early in my career. During a series of dives from outrigger "pump-boats" off the island of Palawan in the Philippines, I found several small, spiny black and yellow brittle stars with their arms clasping the disks of much larger, smooth purple and yellow brittle stars. The terrestrial equivalent of this experience would be to catch sight of baby zebras riding the backs of giraffes. Fortunately, my "giraffes" were small enough to be hauled back and photographed in a makeshift field lab.

Twenty years later, enlightened by work on *Ophiomastix annulosa* and *Ophiocoma scolopendrina*, I finally understood what I had seen in the Philippines—another case of brood parasitism. I went back to the voucher collection that I had preserved from the dives and, to my great satisfaction, found that both of the embracing stars were members of the genus *Ophiomastix*. In our report on the Okinawan stars in *Invertebrate Zoology*, we were able to suggest that brood parasitism may be the rule and not the exception among *Ophiomastix* species.

A note I received after the *Invertebrate Zoology* paper was published seems to vindicate our speculation. A Belgian graduate student wrote that he had read our paper and was initiating his doctoral dissertation research at the coral reef off Madagascar, on what he called a "thrilling symbiosis" between *Ophiocoma scolopendrina* and the black and gray *Ophiomastix venosa*.—Gordon Hendler

Below: On close examination, two brittle stars can be discerned in this photograph. The smaller individual, sitting like a tiny spiked helmet on the spineless central disk of its host, is a juvenile *Ophiomastix janualis*, its slender, banded arms intertwined with the arms of a larger adult *Ophiomastix flaccida*. The fact that these two species were observed in this relationship on several occasions suggests that young *Ophiomastix janualis* are brood parasites of *Ophiomastix flaccida*. Virtually nothing is known about the natural history of the two species; the same can be said for most brittle stars, which number over 2,000 species.

FROM THE ECHINODERM FAUNA OF TONKIN STRAIT: ITS COMPOSITION AND ORIGIN, BY HUBERT LEMAN CLARK (CARNEGIE INSTITUTION OF WASHINGTON, 1921).



Left: These charming vignettes show six different *Ophiomastix* species, all with fleshy, enlarged spines on the arms—some of these animals, and perhaps all members of the genus, are "cuckoo brittle stars" whose young are reared by other brittle star species. *Ophiomastix annulosa*, the first brittle star recognized as a brood parasite, is the reddish species at the lower right.

The illustration offers less detail than a photographic depiction, but it was prepared during a 1913 expedition to the Great Barrier Reef, at a time when scientists took watercolorists into the field instead of digital cameras.

GORDON HENDLER

abduction, albeit lacking in some of the sleazy charm of tabloid journalism. In every case, they make one wonder how and why otherwise reasonable species would make a serious investment in rearing exceedingly unrelated broods of young, often at the expense of their own offspring. The cuckoo stories also offer a keyhole through which we can glimpse the inner workings of evolution.

For these reasons the topic is a flourishing field of study, with an impressive cadre of adherents concerned with the mechanisms and origin of brood parasitism. They view the behavior as a sort of escalating "arms race" that hones the abilities of host and parasite through competition and coevolution. In fact, there is considerable evidence that "moonlighting" facultative parasites (those capable of also living independent of hosts) have given rise to obligate parasitic species, that brood parasites have evolved traits enabling them to gain parental care from one or more host species, and that host species have evolved defenses to thwart parasites.

Cuckoos deceive by rapidly laying single, small, camouflaged eggs that mimic those of their indiscriminating host. Ants appease their hosts with an armory of conventional and chemical weapons. But the ploys of parasites are never perfect, and—depending on the situation—hosts can gain the upper hand. The intended bird victims can liquidate cuckoo eggs or abandon their nests. Parasitic ants that invade a hostile colony at the wrong moment are quickly eliminated. However, in some circumstances it may not pay for hosts to mount a defense against brood parasites. And in rare cases parasites are indirectly beneficial to their hosts.

The brittle star *Ophiomastix annulosa*, much like a cuckoo bird, is clearly a parasite: it furnishes no care to its developing young, which are "incubated" by an unrelated species. However, *Ophiomastix* seems to be a relatively benign parasite, because its young live in the brood pouches of *Ophiocoma* but do not compete directly with *Ophiocoma* juveniles. Although the *Ophiomastix* babies may steal food from their host, they cause the host no significant physical harm.

Nevertheless, why the little interlopers are not simply eliminated by their potential hosts is an enigma. Ophiuroids are generally omnivorous, and one has to wonder if, given the chance, *Ophiocoma scolopendrina* would eat *Ophiomastix* babies. Are the parasitic babies deceiving the host and somehow flying in under its radar? The babies are hardly a formidable foe; their only advantageous accessory appears to be the hooked spines that might lend purchase on *Ophiocoma*. Of course, an arms race may not be called for if the rate of parasitism is low enough, which may be the case here. But knowing as little as we do about the interactions of *Ophiomastix* and *Ophiocoma*, that is not the most satisfying explanation.

A major difference between *Ophiomastix* and many other "cuckoo" species is that *Ophiomastix* adults are not intimately involved in placing their young with a foster parent. At this point, we can only speculate on how the water-borne larvae of the species locate a host, and how the juveniles know when to leave and strike out on their own. We do not know if they "parasitize" the adults of their own species or those of other species of brittle stars. As it happens, nearly all brittle stars have bursae, whether they brood or not. Perhaps all have the potential to brood—if not their own young, then those of another species.

Presumably, brood parasitism originated in the sea early in the history of life. But known examples of brood parasitism in the oceans seem rather few and far between, given the vast diversity of marine animals. The mechanism of brood parasitism in *Ophiomastix* may be an indication of the form that the behavior took in ancient seas. For that reason, and because of all the questions raised and still unanswered, further research on *Ophiomastix* beckons.

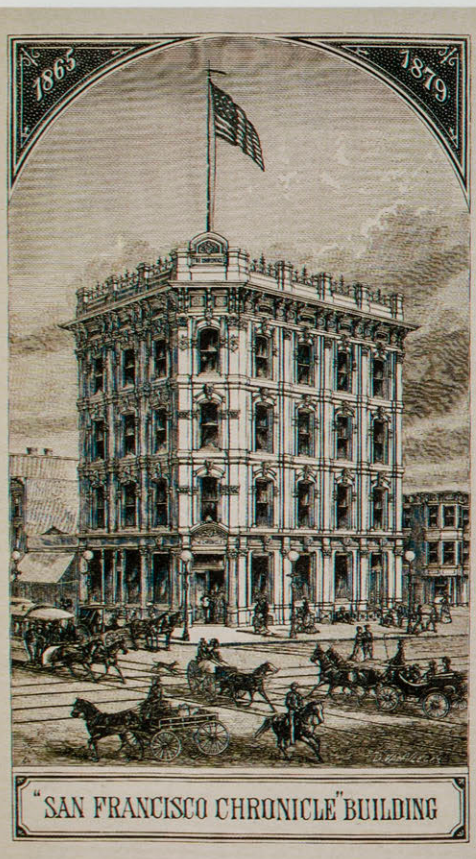
It has been more than 2,000 years since Aristotle made his observations on cuckoos. The story of brood parasitism is more varied than he ever suspected, and its final words have not been written.

Gordon Hendler grew up in the Bronx but, over the years, has lost his captivating native accent and much of his cranial pelt. That he never learned to watch television seems to have fostered one of his peculiar ambitions, to understand absolutely everything about brittle stars, the paragons among spiny skinned animals in the phylum Echinodermata.

In 1985, Dr. Hendler became the Natural History Museum's first curator of echinoderms. He and his wife live in the Santa Monica Mountains, where they raise gophers and other prize-winning garden pests.

Focus on the West

California Newspapers, part 1: The Bay Area



Pages 16 and 17: Plates from *The San Francisco Chronicle and Its History*, a book published by the *San Francisco Chronicle* in 1879.

CALIFORNIA JOURNALISM'S LONG AND COLORFUL HISTORY BEGAN FOUR YEARS before statehood was granted, when Walter Colton and Robert Semple established a newspaper, the *Californian*, on August 15, 1846. The weekly was printed in Monterey on packing paper from a cigar shipment; the subscription rate was five dollars a year, or twelve cents an issue. In May of 1847, the *Californian* moved to San Francisco, where another paper, the *California Star*, had been established four months earlier.

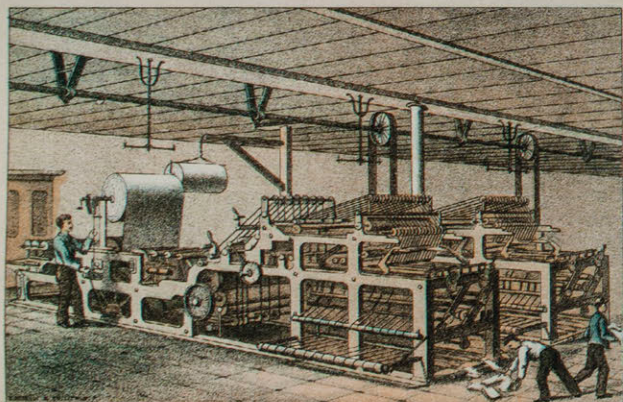
The *California Star* was founded by Samuel Brannan, a Mormon elder who was an ambitious and dynamic entrepreneur. Though biting competitive, both the *Californian* and the *California Star* prospered until June of 1848, when editors and printers joined in the rush for gold and both papers suspended publication. (It was commonly said that gold fever depopulated cities faster than the cholera.) In November of the same year, one of Brannan's editors, Edward C. Kemble, merged the two newspapers to create the *California Star and Californian*, a publication that was absorbed by San Francisco's *Alta California* just a year later.

The *Alta California* was a weekly newspaper like its predecessors, but in January 1850 it became San Francisco's first daily. By this time, many newspapers—including a number of foreign language publications—had been established in San Francisco and Sacramento, but none were as influential as the daily *Alta California*, which even now has a reputation as the "Mother of California journalism." One of its well-known writers was Mark Twain, who contributed letters about his tour of the Holy Land in 1867 (he later refashioned these into the book *The Innocents Abroad*).

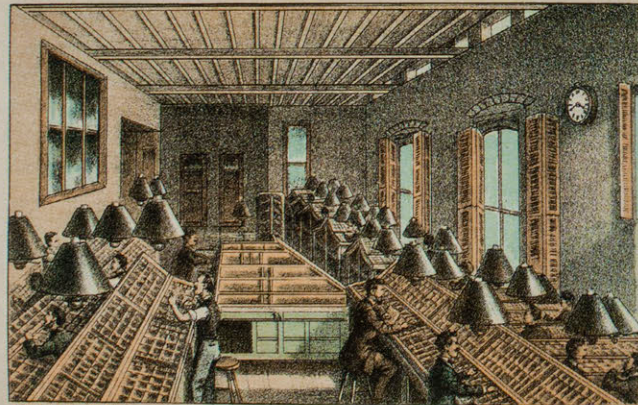
The first major daily newspaper in California was the *San Francisco Bulletin*, founded in 1855 by James King of William. King was a banker before he was an editor, and when his banking business failed during the financial explosion of 1855, he used the *Bulletin* to attack several lawyers, politicians, and other bankers as well as some of the "knaves and rogues" in high places in politics and business. King's slashing 1856 editorials against political boss James P. Casey exposed the latter as an ex-convict from Sing Sing and a professional ballot box stuffer. In May of that year, Casey shot and killed King in broad daylight; Casey himself was then hanged by vigilantes.

Another major Bay Area paper with violence in its history was the *San Francisco Chronicle*, which began as a theatrical news sheet called the *Daily Dramatic Chronicle*. Founded in 1865 by the teenage brothers Charles and Michael H. de Young, the paper almost immediately established itself by scooping the other local press on the story of Lincoln's assassination. Three years later, the paper's name was changed to the *Daily Morning Chronicle*, and it became a successful and sensational competitor with two other San Francisco journals, the *San Francisco Bulletin* and the *Call*.

In 1880, the *Chronicle* lambasted the Workingmen's Party and its candidate for mayor of San Francisco, the notorious Reverend Isaac Kalloch. In a speech, Kalloch replied in kind, and Charles de Young responded by shooting and wounding Kalloch. Kalloch's son then shot and killed de Young, leaving his brother to continue the *Chronicle*. Under M.H. de Young, the journal became



THE GREAT HOE WEB PERFECTING PRESSES: 33,000 COPIES AN HOUR EACH.



THE COMPOSITORS' ROOM.

17

Monumental (and Not so Monumental) Mammoths

JOHN M. HARRIS

*A special exhibition on
view at the Page
Museum this summer
focuses on the
mammoth, the largest
land mammals in
southern California
during prehistoric times*

ALTHOUGH THE WORD *MAMMOTH* IS OFTEN USED TO DENOTE LARGE SIZE, mammoths were not the largest of terrestrial vertebrates—these, of course, were the sauropod dinosaurs. They were also not the largest land mammals; this honor goes to the extinct rhino formerly known as *Baluchitherium*. Some would argue about whether mammoths were even the biggest proboscideans, given that certain extinct elephants were of comparable size to their mammoth kin. The fact that there were pygmy or dwarf mammoths only 4 to 6 feet high at the shoulder further complicates the size ranking debate.

Even the origin of the name *mammoth* is shrouded in mystery. Some claim it was derived from the biblical *behemoth*, the huge yet gentle vegetarian mentioned in the Book of Job. However, British paleontologist Adrian Lister suggests that the word originated from the Estonian *maa mutt*, meaning "earth mole." I have to admit to being intrigued by the eastern European legend of huge creatures that burrowed beneath the frozen ground of the far north and died immediately if they ever became exposed to sunlight. And, of course, the earth mole legend does provide a rational explanation for the elephantine frozen corpses that are sometimes found thawing out of the Eurasian tundra—as well as for the fact that nobody in recorded history has seen a mammoth alive!

One of these enormous carcasses will be painstakingly extracted from its frozen grave this year by scientists working in Siberia on a project documented by cable television's Discovery Channel. A possible result of the effort could put an end to the earth mole legend: at least a few members of the excavating team look forward to obtaining genetic material for cloning, to produce "a living, breathing member of the long extinct genus *Mammuthus*." If this goal were achieved, our planet would again have not just two but three types of elephants living at the same time.

MAMMOTHS BELONG TO THE ELEPHANTIDAE, the family that also contains the Asian and African elephants. The two living elephant species can be readily distinguished from each other by their physical appearance. African elephants, *Loxodonta africana*, are larger overall than Asian elephants, carry their heads below the level of their shoulders, and have large ears, flattish foreheads, large tusks, and two finger-like projections at the tip of their proboscis. In contrast, Asian elephants (*Elephas maximus*) carry their heads above the level of their shoulders and have smaller ears, a domed forehead, smaller tusks (the tusks may be absent altogether in females), and only one finger projection at the tip of the trunk.

Mammoth species varied in size from dwarf to elephantine, but all had foreheads that were bulbous and backs with a distinct downward slope from the shoulder to the haunches. Woolly mammoths, the only mammoth species from which "soft parts" are known, resembled Asian elephants in having small ears and a single "finger" on their trunks.

The three proboscideans may also be distinguished from each other by the structure of their teeth, the feature most frequently used by paleontologists. The teeth of African elephants have transverse ridges or plates composed of thick enamel, and these form a diamond-shaped pattern when worn. Asian elephant teeth are taller and have more plates but thinner enamel. Mammoths had the tallest teeth of the three types, with the greatest number of plates and the thinnest enamel.

The tall teeth of the elephantids represent an adaptation for feeding on grass. The cell walls of grasses contain particles of silica called phytoliths, and these have an abrasive effect on tooth enamel. Mammal species with a diet largely composed of grasses tend to have high-crowned teeth, which wear out less rapidly than low-crowned teeth and hence help to prolong the life of the individual. The mammoths' high teeth were ideally adapted for eating grass.

The family Elephantidae originated in Africa toward the end of the Miocene Epoch, 8 to 10 million years ago, at a time when tropical forests began to be replaced by more open grassland. Elephants thus made their initial appearance at the same time as the ancestors of some of the other mammals characteristic of Africa today—the hippos, the grazing antelopes, and humans.

The ancestral elephant stock, which fed on a mixture of grasses and softer browse, had a well-developed trunk, low-crowned teeth, and tusks in both upper and lower jaws. By 5 million years ago, early representatives of mammoths and both types of elephant had lost their lower tusks and



Woolly mammoth, one of a series of twenty-four oil paintings of prehistoric scenes by Charles R. Knight. Completed in 1946, the set was purchased by the Natural History Museum in 1952 and 1953. Knight was the first artist to restore extinct species as dynamic living creatures. His classic mural of the Rancho La Brea tar seeps is on display at the Natural History Museum.

known from fossil finds in California's Anza Borrego State Park and elsewhere.

- ◆ The woolly mammoth (*Mammuthus primigenius*) was restricted to the fringes of the ice sheet that enveloped the northern part of the continent during the Pleistocene Ice Age.
- ◆ The common North American mammoth (*Mammuthus columbi*) was distributed throughout much of the rest of the continent, although some scientists believe its fossil remains may represent four different species—the Columbian mammoth, the Imperial mammoth (*Mammuthus imperator*), Jefferson's mammoth (*Mammuthus jeffersonii*), and the dwarf mammoth (*Mammuthus exilis*).

COLUMBIAN MAMMOTHS undoubtedly trudged along what is now Wilshire Boulevard at some time in the past 40,000 years: their fossilized bones have been found at a number of different localities in southern California, and remains of more than thirty-five individuals have been recovered from the Rancho La Brea asphalt deposits, most of them during the 1913 excavation of a site in Hancock Park known as Pit 9. The Rancho La Brea specimens were about the size of an African elephant: adult males would have stood 12 to 13 feet tall at the shoulder and weighed 8,000 to 10,000 pounds. Although the mammoths from Pit 9 include individuals that were very young (about 2 years old) and some that were very elderly (age 60 or greater), analysis of the wear of the teeth and the degree of fusion of the femurs indicates that most were young adult males 30 to 40 years old at the time of their death.

Why are mammoth remains from Rancho La Brea found almost exclusively in Pit 9? Perhaps it was the only place where conditions were right for trapping mammoths with seeping asphalt. Or perhaps the mammoths were only present in the Los Angeles Basin for a short period and this was the only seep active at the time.

Dwarf mammoth remains recovered from Late Pleistocene localities on the California Channel Islands are often interpreted as belonging to a subspecies of the Columbian mammoth called *Mammuthus columbi exilis* (the domed skull upon which the description of the subspecies was based is on display—as one of the treasures of our museum—in the Exposition Park building's Director's Gallery).

During Late Pleistocene times, sea level was lower than it is today; as a result, the Channel Islands were larger as well as closer to the mainland. Living elephants are good swimmers and, although their eyesight is poor, they have a good sense of smell; presumably mammoths had similar attributes. It is easy to imagine Columbian mammoths being lured into swimming across

were feeding almost exclusively on grass.

African elephants remained on the African continent, but fossil finds show that Asian elephants were prolific in both Africa and Eurasia until the end of the Pleistocene some 10,000 years ago; today they are restricted to parts of western Asia. Meanwhile the mammoths, which had migrated out of Africa into northern Eurasia, became the only elephantids to cross the Bering Strait and enter the New World, following the path taken 8 million years earlier by the shovel-tusked gomphotheres, their distant relatives.

Mammoths first reached North America about 2 million years ago. The number of mammoth species that were here is still debated, but most experts would agree to three lineages:

- ◆ The southern mammoth (*Mammuthus meridionalis*), an early migrant from Eurasia and the first mammoth species to leave Africa, is

the channel by the smell of vegetation wafting back to them from the islands on the prevailing westerly winds. Once at their offshore destination, they might have become marooned there because they could neither see nor smell the mainland.

Mammals that become isolated on islands and establish populations there tend to decrease in absolute size over time to be better able to survive with the limited food resources. The remains of adult dwarf mammoths from the Channel Islands show that they stood only 4 to 6 feet tall at the shoulder, less than half the size of the mainland Columbian mammoths from which they were descended.

Mammoths became extinct in most of the Northern Hemisphere about 12,000 years ago, although an isolated population of dwarf woolly mammoths survived on Wrangel Island in the northern Arctic Ocean until about 4,000 years ago. In North America, many other large mammals—including the saber-toothed cat, American lion, dire wolf, short-faced bear, American mastodont, giant ground sloths, camels, and horses—also died out at about the same time as the mammoths.

The cause of the extinction event at the end of the Pleistocene has been hotly debated. Proponents of the "Pleistocene overkill" hypothesis attribute the sudden demise of many large mammals to the arrival of humans in the New World, and there is certainly evidence that the earliest Americans hunted mammoths. Advocates of the environmental change hypothesis point out that, at the end of the last glacial episode, the Wisconsinan, the average annual temperature increased by 9 degrees Fahrenheit in less than a hundred years, and this general warming would have had a considerable impact on prevailing habitats and the animals associated with them.

Another school of thought suggests that diseases introduced by immigrant humans may have catastrophically affected the endemic North American mammals. It is interesting to speculate about the relative merits of these and other ideas about the causes of mass extinction—particularly as overpopulation, global warming, and incurable virus infections threaten the world as we know it today.

MUCH OF OUR KNOWLEDGE of mammoths is based on study of bones and teeth recovered from various paleontological and archaeological localities, but the occasional discovery of a frozen woolly mammoth carcass in northern Eurasia offers the opportunity to learn more about the biology of these fascinating creatures. The recovery of a frozen mammoth found in northern Siberia in 1998 was featured in a 2-hour Discovery Channel program in March of this year. Visitors to the Discovery Channel Web site (www.discovery.com) were able to follow events in sequence, from the gathering of an international team of mammoth aficionados in September 1999 to the extraction in February 2000 of a frozen block believed to contain much of the body.

The last point in the documented saga was the deposition of the block near an ice cave at Khatanga, Siberia, about 150 miles from where it was excavated. When the weather warms up enough for the cave entrance to be widened, the block of ice is to be moved inside and then slowly thawed, with a bank of hair dryers, and prepared over the period of a year, with the hope that a gradual defrosting will provide more information about the dead mammoth—and perhaps even some clonable DNA.

For some paleontologists, the possibility of re-creating and examining a long-extinct giant mammal through the use of new technologies is a dream come true. For others, the revival of a species whose habitat has long since disappeared is an ethical no-no. Arguments about cloning may well be moot, however, if—as one member of the team has predicted—all that remains of the mammoth are clumps of hair and a few bones!

Dr. John M. Harris, chief curator and head of paleontology, has published a dozen papers on extinct proboscideans but prefers to work with more easily portable ungulate fossils. He and Christopher A. Shaw, collections manager for Rancho La Brea, cocurated the exhibit Mammoths: Wild and Woolly, which is on display at the Page Museum through September 17.

Curt Abdouch, who is administrator for the Page Museum, spearheaded the organization of the mammoth exhibition and planned a number of related programs and events.

Museum on the Move

Fly Collage

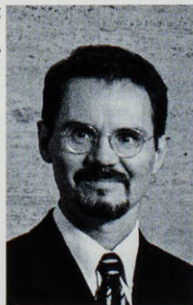
At right is a digital image of a female bee-killing fly, genus *Melaloncha*, from the Peruvian Amazon. These tiny flies (about 1/6 of an inch long) are difficult to photograph because, at the high magnification needed to capture details of their anatomy, the depth of focus becomes extremely shallow. To create this relatively sharp and comprehensive profile, illustrator Jesse Cantley assembled a composite of about sixty views of the one fly specimen.

The abdomen of a female bee-killing fly is elongated to form a pointed dagger, which is used to inject an egg inside its bee host. After hatching from the egg, the maggot consumes the contents of the bee's body, eventually causing its death. The larva then pupates inside the empty husk of the bee and finally emerges as an adult fly.

Although only about thirty have been described to date, there are probably more than one hundred species of these tiny creatures throughout tropical America. They are part of the hidden fauna of the rain forest that I am studying; with a 3-year grant from the National Science Foundation to survey insects in Colombia, I expect to find many more of these gruesome but fascinating flies.

The carefully composed photograph of the *Melaloncha* species will soon be published with its formal description and name to ensure that others can recognize this particular fly when they encounter it.—*Brian V. Brown, Associate Curator of Entomology*

New Vice-President of Exhibits



MARC CARTER

Michael Nauyok has been appointed vice-president of exhibits, a position he has held in an acting capacity since June of 1999.

Mr. Nauyok joined the museum staff in 1997 as director of project planning. In this capacity, he was responsible for the

installation of the *Duel in Bronze* monument outside the north entrance of the Natural History Museum, the renovation of the building's staff entrance and café, and the completion of a number of remodeling and deferred maintenance projects in Exposition Park and at the museum's other facilities. He also oversaw the design and construction of

the Pavilion of Wings, the butterfly house on the Natural History Museum's south lawn, as well as *Butterflies in Living Color*, a special 1999 exhibition in the museum's Dart Gallery.

In 1999, Mr. Nauyok took on additional duties. As director of the Art Department, he established and now supervises a new office responsible for two- and three-dimensional art, photography, and a coordinated approach to graphic design for the museum as a whole.

While heading the Exhibits staff over the past year, Mr. Nauyok has dramatically reorganized operations there to reflect his strong belief in museum-wide collaborative efforts on exhibition design. The teams he has organized have successfully completed the design and renovation of a new special exhibition gallery on the Natural History Museum's main floor; they have also revamped the butterfly pavilion for this year's season and installed several changing exhibitions at the Exposition Park and Page Museums.

Mr. Nauyok, who holds master's degrees in architecture and business administration from the University of Illinois, Urbana, came to the museum from the J. Paul Getty Trust, where he was part of the team responsible for construction of the Getty's Research Institute, its 1-million volume library, and the facility for its distinguished Conservation Institute.

New Curator of Mammals



SARA DEAN ACOSTA

Inés Horovitz has joined the staff of the Natural History Museum as Assistant Curator of Mammals. Dr. Horovitz was born in Buenos Aires, Argentina, and attended school there until moving

to the U.S. for graduate studies; she received her Ph.D. from the State University of New York at Stony Brook. Her doctoral dissertation—on the systematics of Neotropical monkeys—involved examination of both the bodily and molecular traits of her subjects; this work and subsequent studies led her to observe live monkeys in the forests in Argentina's Iguazu National Park and to collect their fossils in Cuba and Patagonia.

In 1997, Dr. Horovitz joined the staff of the American Museum of Natural History as a post-doctoral fellow. There, she investigated the

evolutionary relationships among major groups of placental mammals (primates, artiodactyls such as cows and sheep, shrews, bats, etc.) and how fossil species from the Cretaceous of Mongolia are related to these groups; as part of this project, she participated in several expeditions to the Gobi Desert to collect fossil vertebrates.

At our museum, Dr. Horovitz will have responsibility for the collection of about 100,000 mammal specimens. She will make use of and add to this assemblage as she continues her studies of the relationships among the placental mammals; she also plans to conduct field work on modern mammals in South America, Africa, and Southeast Asia.

Hardman Mineral Donation

Jessie Hardman has donated her collection of more than 20,000 mineral specimens, most of them thumbnail sized, to the museum's Mineral Sciences Section. The well-organized and carefully documented assemblage is noteworthy for its comprehensive coverage of species and localities; it includes several important study suites—one of California type-locality minerals.

For more than six decades, Mrs. Hardman has devoted herself to the promotion of the mineral and gem hobby. She was a founder in 1936 of the Long Beach Mineral and Gem Society and has since held a variety of posts in local and national amateur societies, including the presidency of the California Federation of Mineralogical Societies. In the early 1960s, she began a long and fruitful association with our museum; she has been an active donor, volunteer, and advisor to the Mineral Sciences Section and is a founding member of the board of directors of the museum's Gem and Mineral Council.

In recognition of Mrs. Hardman's passion for educating the public about the minerals of California, the Natural History Museum recently dedicated its extensive Minerals of California exhibit to her.—*Anthony R. Kampf, Curator of Mineral Sciences*

Dinosaur Ball 2000

The Natural History Museum's eighteenth annual gala fund-raiser was a tremendous success!

Conga drums and champagne welcomed guests at the North Entrance, drawing them into the museum, where they were surrounded by a lively

Exhibitions

IN THE EXPOSITION PARK MUSEUM . . .

The Pavilion of Wings: A Living Butterfly Experience

Continuing through September 4, south lawn
Hundreds of live, free-flying butterflies flaunt their beauty for visitors while going about their business in the museum's butterfly garden.

Presented by *HomeBase*

Savage Ancient Seas

Continuing through October 9, first floor special exhibits gallery

A walk through an underwater world of 70 million years ago, in late Cretaceous times, when huge and mostly carnivorous reptiles and fishes dominated a seaway that covered the center of the North American continent.

Wildlife Photographer of the Year

August 5 through November 5, Dart Gallery

Eighty winning and highly commended images from the prestigious BG Wildlife Photographer of the Year Competition organized by *BBC Wildlife Magazine* and the Natural History Museum, London, and sponsored by British Gas International

Fetishes from the Walker Collection

Continuing, first floor stair landing

More than one hundred of the 3,951 Zuni fetishes donated by Dr. and Mrs. Boyd W. Walker. The small sculptures span the last three decades of the twentieth century, when new stones and

shells were used to portray unconventional subjects and exotic animals.

Meteorites: Great Balls of Fire!

Continuing, Hall of Gems and Minerals

This special exhibition includes the rare Los Angeles Meteorite, the first from Mars known to have landed in the United States, and includes an array of different types of meteorites, a sampling of "meteor-wrongs" (items that people have mistaken for meteorites), and tips on how to identify the real thing.

AT THE PAGE MUSEUM . . .

Mammoths: Wild and Woolly!

Continuing through September 17

A celebration of the proboscideans that were native to North America during late Pleistocene times, including the enormous Columbian mammoth whose remains are found among 10,000- to 40,000-year-old Rancho La Brea fossils. Visitors can feel casts of a 4-foot-long thigh bone and trackways of a Columbian mammoth and view skin samples and tusks.

Annual Excavation of Pit 91

Continuing through September 10, Wednesdays through Sundays, 10 a.m. to 4 p.m.

The famous annual excavation of Ice Age fossils is underway once again at Pit 91, on the grounds of Hancock Park. Visitors can watch from a viewing station as paleontologists and volunteers descend into the pit and dig to recover the bones of beasts that died in the sticky asphalt deposits thousands of years ago.

Tamkin spoke of their involvement with the museum and extended their thanks for the honor and for their gifts, bronze life-sized renderings of a baby dinosaur just emerging from its shell.

Approximately 650 members of the museum family participated in this year's Dinosaur Ball, raising more than \$400,000; the net proceeds from the event will support the museum's research and public programs. The museum is grateful to the individuals, corporations, and foundations who supported and attended the ball; we are particularly appreciative of Charlotte Berkman and the Dinosaur Ball Committee of the Alliance Board of Directors for their outstanding work.—*John Crabtree-Ireland, Dinosaur Ball Coordinator*

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mix of soft jazz, blues, and full-brass-band swing, caviar and martini bars, and tray-passed hors d'oeuvres. Ball attendees posed for digital portraits inside the new exhibition, *Savage Ancient Seas*, and these were later delivered to them at their tables.

After cocktails, trumpets heralded the opening of the dining rooms, inviting guests to take their seats in the African Mammal Hall, North American Mammal Hall, and Rotunda, which were dressed, respectively, in red, yellow, and aqua blue. In a special video presentation, Museum President and Director Dr. James L. Powell introduced the honorees of the evening, Mr. Franklin Otis Booth, Jr., and Dr. S. Jerome and Judith D. Tamkin. In their pre-recorded messages, Mr. Booth and Dr. and Mrs.

A Round of Applause . . .

For the last ten years, the Nesburn Family has generously funded the museum's Dr. Henry and Lilian Nesburn Awards, a writing contest for children in grades 4 through 8. Created to spark curiosity in the natural sciences as well as to hone language arts skills, the annual contest culminates in a special ceremony at the museum, attended by Mrs. Nesburn herself, where children receive their scholarship money in addition to a certificate honoring their hard work.

The contest rewards writing excellence in three categories—fiction, factual reporting, and poetry. This year's winners and recipients of honorable mention, who wrote so articulately on the theme of North American mammals, are listed on the museum's web page, www.nhm.org. Our congratulations to these outstanding students, and to their teachers as well.

Jahan Shahryar of the Mirman School was the Nesburn Competition winner among fourth grade poetry entries; her teacher is Julia Candace Corliss. Jahan's winning entry, "Bear," is printed at right. —Leah Melber, *Science Education Specialist*

BEAR

by Jahan Shahryar

Watch out!

I can see you, salmon,

I'm dangerous to you

I'll eat you, salmon

Then I'll sleep

In the white snow of joy

Till Spring

I can now smell Spring

So I'll wake up

I am powerfully running

To find food

That's me,

The Bear,

I'm free.

Hartmann ♦ Mr. and Mrs. Thomas Reddin ♦ Bill and Debby Richards ♦ Mr. and Mrs. Sheldon Richman ♦ Charles and Maryann Rinsch ♦ Charlene and Jim Royer ♦ Tani and Lou Krouse ♦ Mr. and Mrs. Karl M. Samuelian ♦ Bob and Peggy Sloves ♦ Allen and Marilyn F. Solomon ♦ John and Donna Sussman ♦ Mr. and Mrs. William H. Tilley ♦ Mr. and Mrs. Richard S. Volpert ♦ Betty & Sidney Wallis ♦ M. and Mrs. Robert K. Wrede ♦ Lorraine P. Young

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Charlotte and Walter Berkman (*above, left*) join Dinosaur Ball honorees Judith and Dr. S. Jerome Tamkin under the giant sea turtle that is a highlight of the museum's *Savage Ancient Seas* exhibition. Mrs. Berkman was chair of the ball committee, and Mr. Berkman, who was president of the Alliance Board, was a committee member. Photograph by Dick Meier.

Left: Dinosaur Ball honoree Franklin Otis Booth Jr. (*left*) with Edward P. Roski Jr., on the balcony of the Staples Center in downtown Los Angeles. Ed and Gayle Roski and Majestic Realty Company sponsored a reception in the Staples Center's Grand Reserve Club, *far left*, prior to the Dinosaur Ball, to honor major donors and supporters of the fund-raising gala. Photographs by Michael Houtz.



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Designed by Dana Levy, Perpetua Press

Printed on recycled paper by Castle Press

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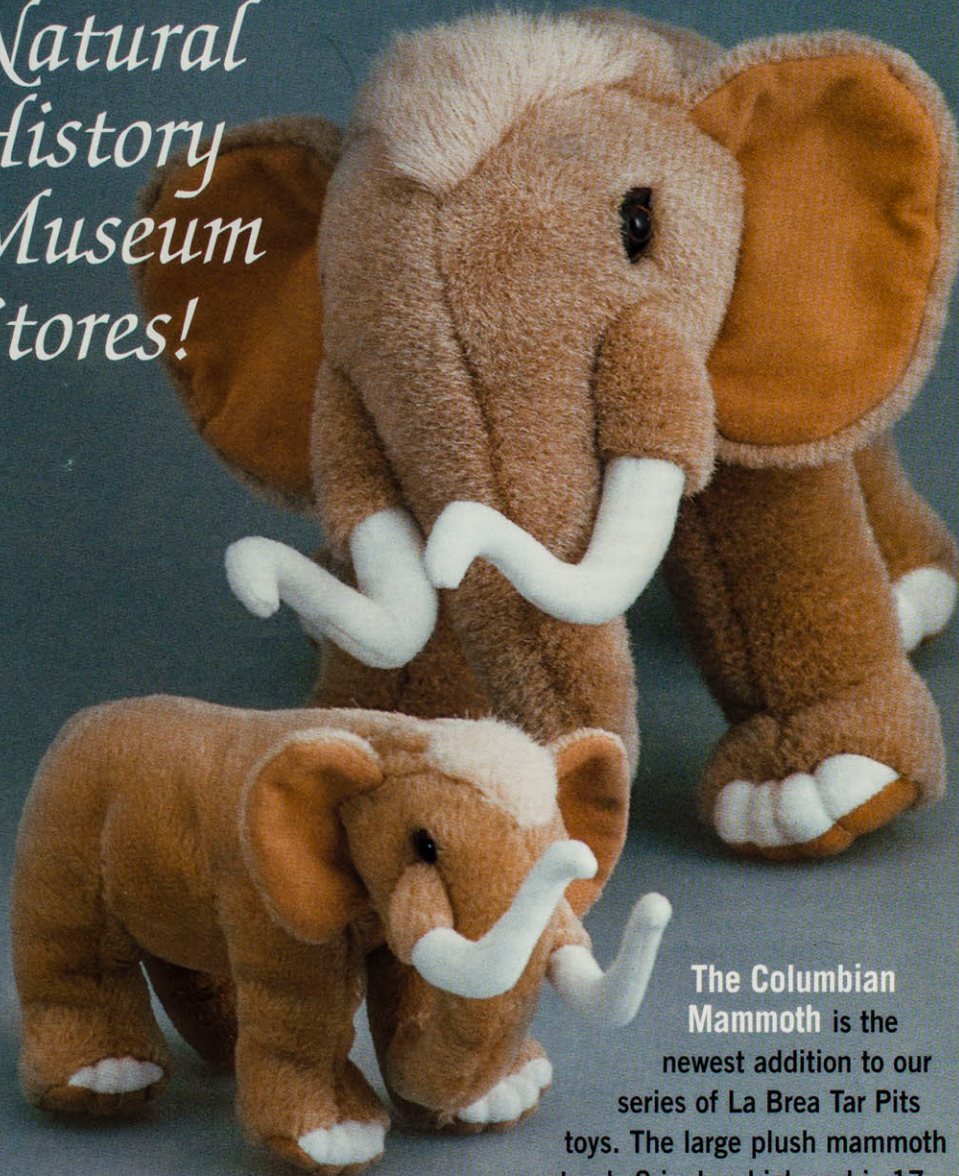
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